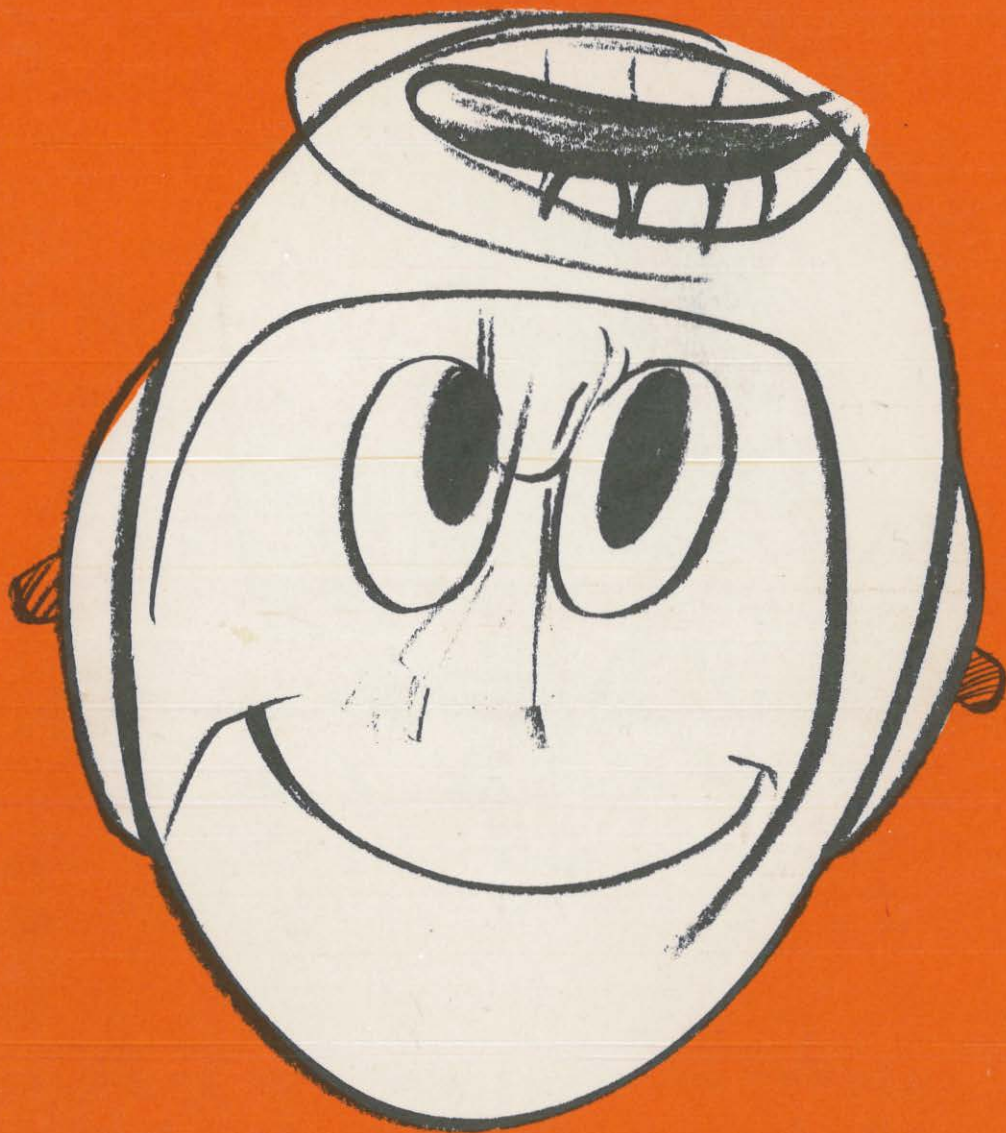


1949

VERTIGO SENSE

NAVAER 00-80Q-33



NAVY MEDICINE

NAVAER 00-80Q-33

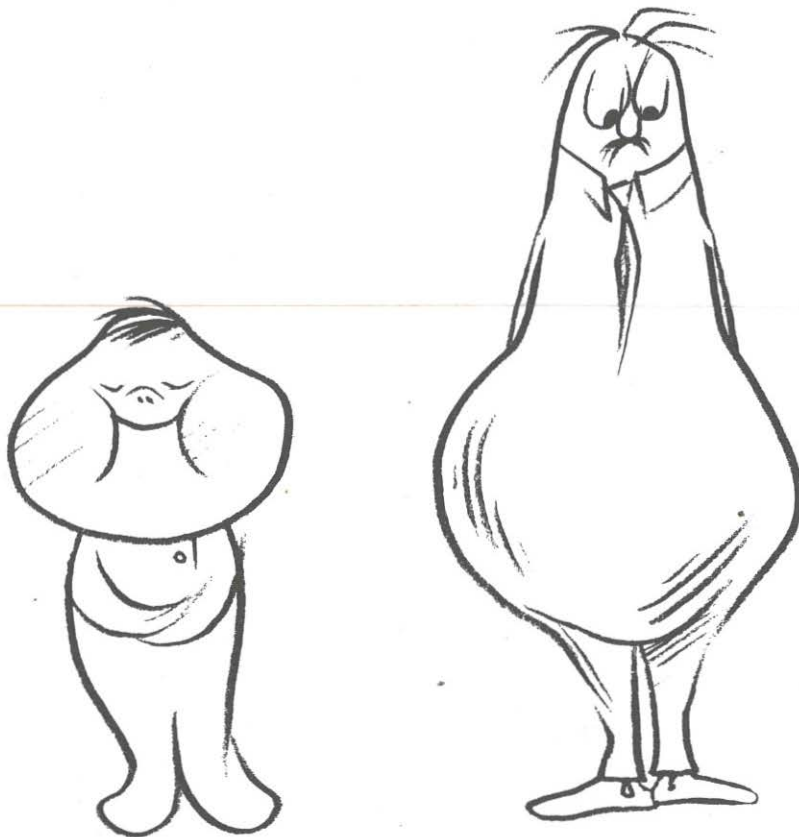
VERTIGO SENSE

VERTIGO SENSE



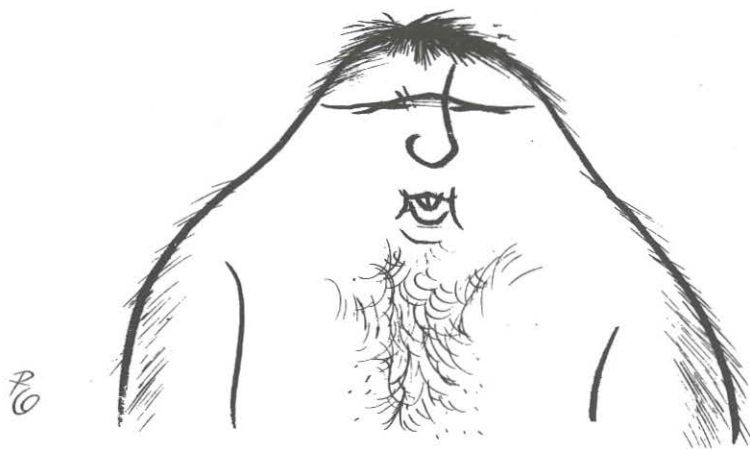
ISSUED BY AVIATION TRAINING BRANCH,
OFFICE OF THE CHIEF OF NAVAL OPERATIONS,
U. S. NAVY • 1949 • NAVAER 00-80Q-33

VERTIGO seems to be easy on the many and rough on the few, just like mumps. Little boys with mumps may not have to miss a day in the sandpile, but some big ones never quite get over it. One school of

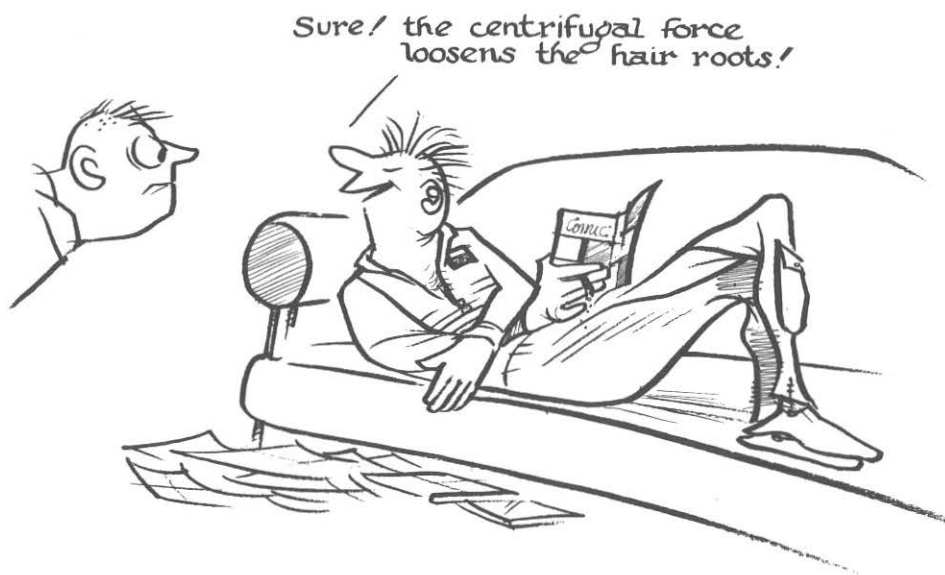


pilots laughs off vertigo as a comic ailment that happens to people who are naturally scared stiff in airplanes, while another group maintains it's like getting hit over the head with a horse.

The word itself is as hard to define as the beginning and end of a wrestler's neck. One reason you hear so much nonsense about vertigo in



airplanes is that certain pilots use it to explain everything from falling hair to athlete's foot.

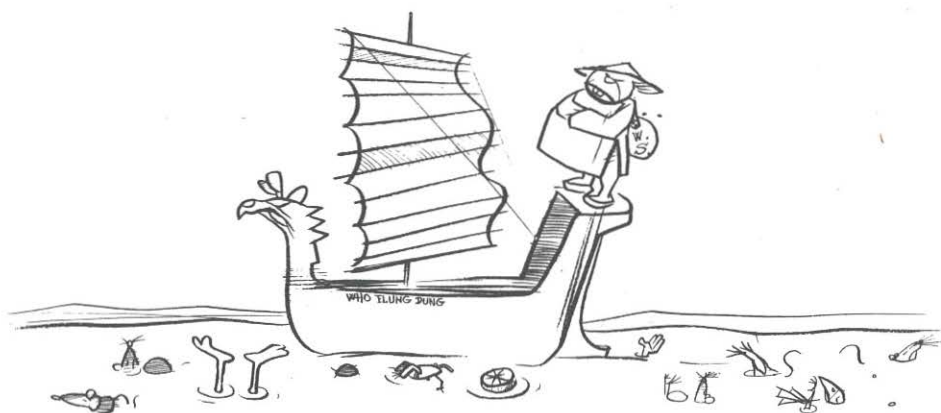


To people who stay on the ground, the word means "dizziness or swimming of the head." The family doctor back home probably has two or three cases of that kind of vertigo on his hands right this minute. His patients feel like whirling dervishes and there's not much he can do to

And she has no real
reason for it!



help. One remedy is watermelon seeds, something the doctors picked up from Chinese boatmen, who chew the seeds to help overcome dizziness on the Hwang Ho and the other sweet-smelling rivers in that part of the world.



The only real connection between ground and aerial vertigo is the confusion involved in both. A poor old lady with the spells is bothered, naturally enough; and the pilot with vertigo in an airplane may not know which end is up. That's as far as the comparison goes. Back on the ground the same pilot is as normal as Sears Roebuck in Oklahoma. The last time he was ruffled was when he appeared in public without pants at the age of four.



So aviator's vertigo is a confusion connected with being in airplanes, which doesn't get us very far. Dilbert feeding the wrong gas tank or turning on the de-icer boots a hundred feet over Death Valley would fit that definition perfectly.

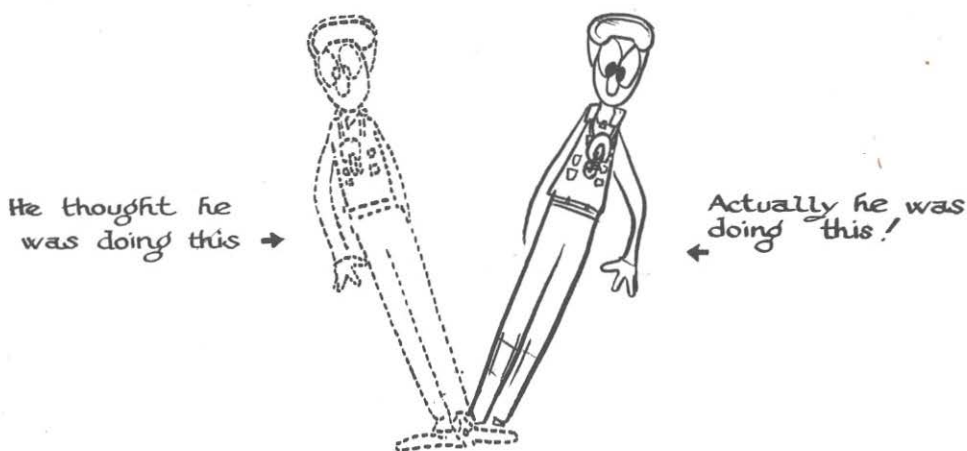
The word means a particular kind of confusion in the air.

A fighter pilot was flying a thousand feet above a 6000 foot overcast of broken clouds about thirty miles from home base. Spotting a hole, he dove through on contact at a steep angle, working his speed up to about

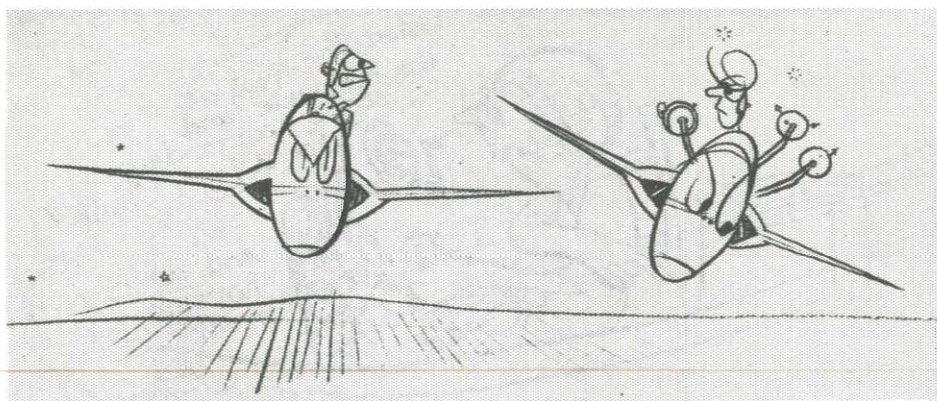
200 knots. He came out of the overcast at about 900 feet in a left bank. For some reason he thought he was in a right bank and when he tried to correct he made the left bank worse. His instruments told him he was wrong and he was able to level off in time.



The difference between the feeling and the fact spelled vertigo. The pilot felt as if he were in one attitude; actually he was in another. Vertigo is that kind of aerial confusion.



Another pilot, flying wing on a dark night, followed his leader through several very smooth turns without even knowing it. When the leader finally straightened out, the wingman was sure the leader was in a bank. Actually his own plane was flying along tilted.



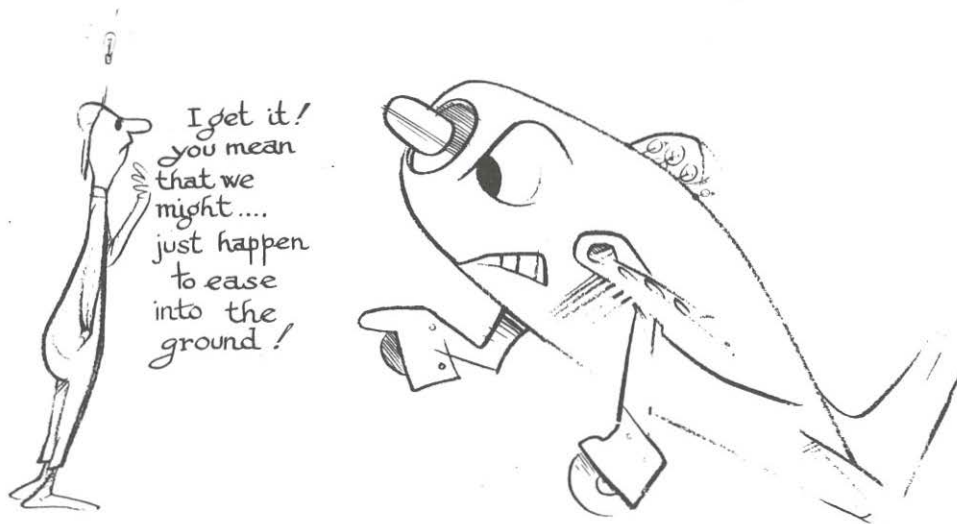
Vertigo again. The pilot acted as if his plane were doing one thing; the truth was something else.

A third fellow, on instrument instruction under the hood, first made some turns and then was directed to fly straight and level. But he kept on making turns. He *thought* he'd straightened out. They were in a diving spiral before the instructor could take over.

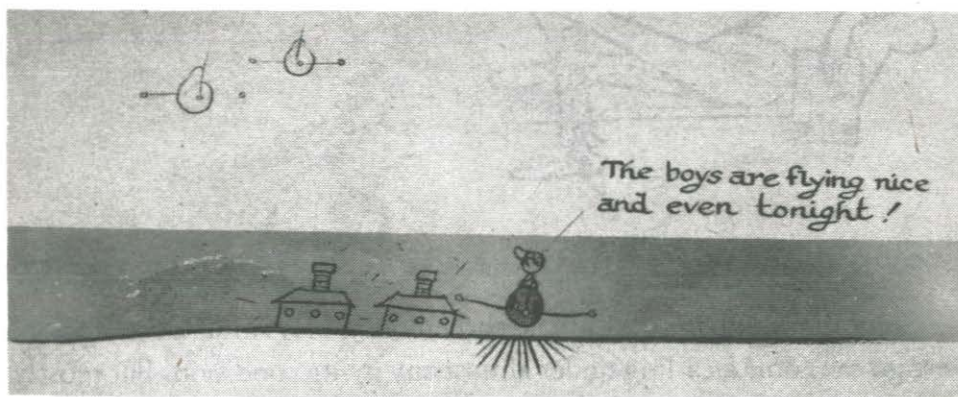
And so it goes. Another pilot reports that he sometimes has the feeling, after rolling out of a turn, of turning in the opposite direction instead of being straight and level. There's also the case of the fellow riding through the clouds with the automatic pilot set at straight and level and having the sensation of dropping. And the pilot who followed the star one dark night and felt that all the stars were swinging around.

To many pilots, vertigo amounts to almost any feeling or sensation in flight that's not so.

Even Dilbert can figure out the rugged possibilities involved in such distortions of fact by feeling. He can put himself in the place of the fellow

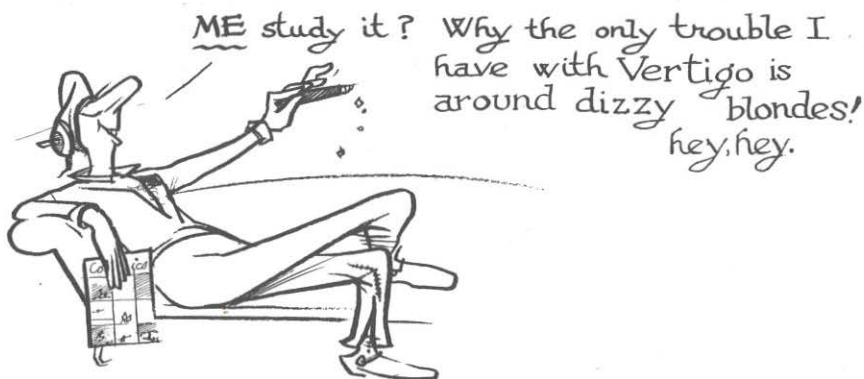


following two planes one moonlight night. Somehow he confused the lights of houses on the ground with those of the planes and tried to join up on a couple of six room bungalows, complete with tile shower and green lumber. He finally made out the outlines of the houses in the moonlight and climbed out of these, but he was close enough to make a down payment.



"Vertigo," says one medical man, "is associated with any situation when the pilot's behavior does not accord with objectively correct environmental facts," a statement which covers as much territory as Texas but does describe the situation. The lad under the hood thought he was straight and level when he was turning. The pilot in the moonlight mistook house for plane lights and acted accordingly. The wingman flew his plane on the mistaken notion that he was straight and level and the leader out of whack.

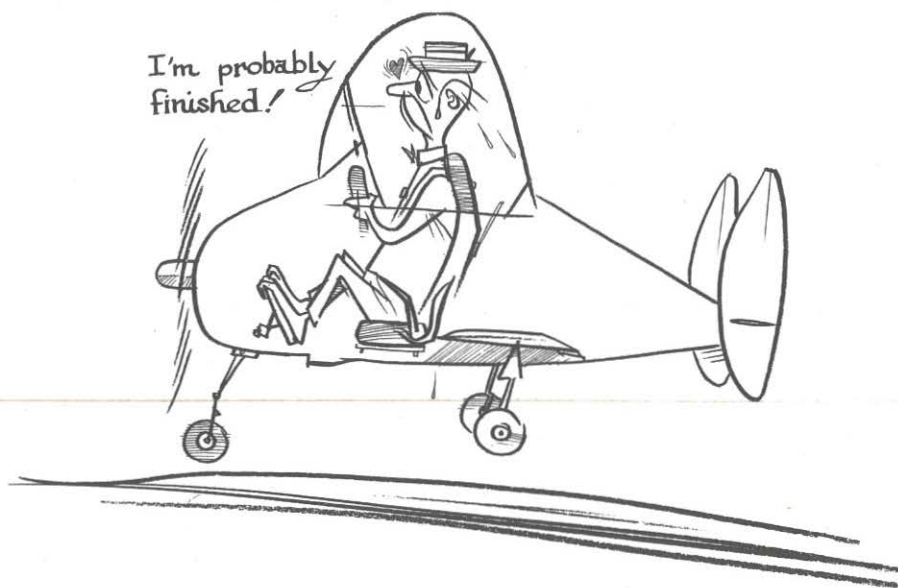
If that kind of thing happened to every pilot every time he took to the air, aviation people might just as well close up the hangars and go back to the bow and arrow. In the experience of most pilots, though, vertigo is a fairly rare affliction. The real danger, in fact, may be that flyers don't get vertigo often enough to prepare themselves for it. Some pilots are completely bewildered when they first spot the difference between what they feel and what the instruments say they ought to feel. Or, if they're like Dilbert, they don't know enough about the tricks their own senses can play on them to double-check before taking action.



COUNT ON DILBERT TO MAKE THE WRONG APPROACH TO VERTIGO

Some of the experts play up the part emotion plays in aerial confusion. Vertigo can come a-calling under almost any flying conditions but mostly when ultra-cautious pilots figure danger is following every turn of their

props—at night, in clouds, or at that crucial moment when they can't decide whether to fly instrument or contact. A naturally timid soul who gets vertigo under such circumstances is likely to find his heart fluttering up there between his big blue eyes. His fear may compound his confusion, leading to grave foolishness.



A few are scared silly by the idea of vertigo. They talk about it the way Nubbin and Gubbin discussed the Black Death back in the middle



ages. Until they remember about flight pay and inflation, they're almost ready to turn in their wings. But the hard-boiled character who finds all

Me get
Vertigo?
NAW!



this very funny indeed—like somebody else with the mumps—is just as foolish. True, vertigo seems to hit some harder than others: the beginner, for example, more than the fellow with five thousand hours, although the veteran flyer is not immune. But the medical people make the reasonable point that since everybody's body is in general like everybody else's, *the physical causes for vertigo apply to anybody.*



Once the physical causes of aerial confusion are tied down, the less mumbo-jumbo you're likely to hear about vertigo. "Soon the mystery

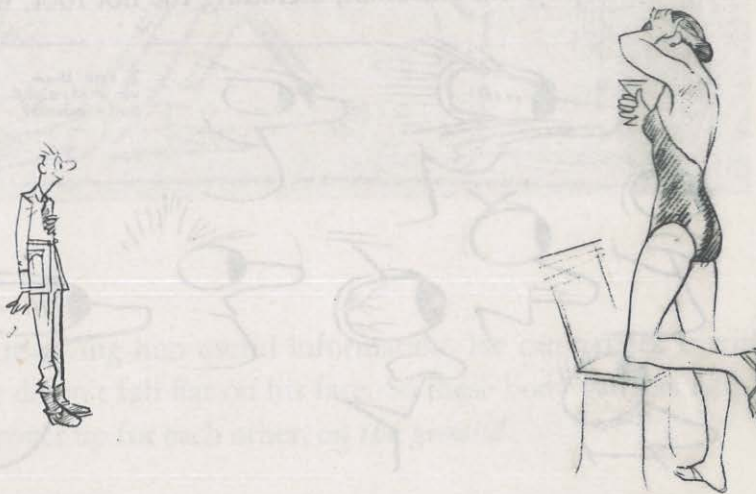
will be gone," as the girl said to Dilbert when her pneumatic falsies sprang a slow leak.



The problems of vertigo and other forms of what the doctors call "disorientation in flight" are the subject of much serious and expensive research. You'll hear about it from the flight surgeon. Right now, enough of the physical causes for vertigo are understood to minimize the mystery of these aviation illusions.

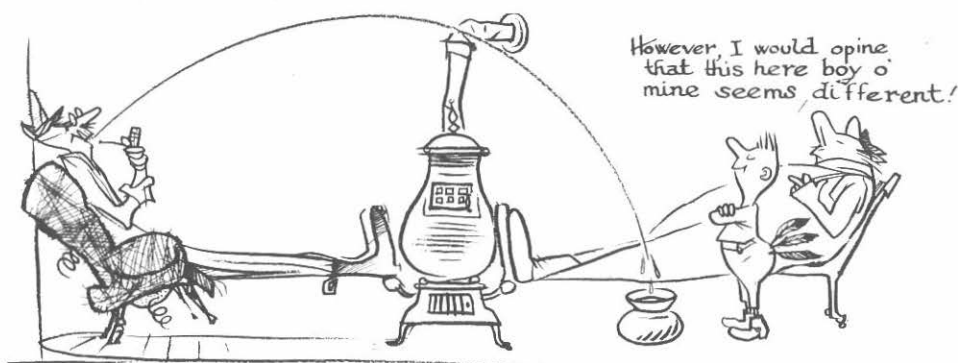
THE BODY BEAUTIFUL

The frame of Wanda Laflem, sensation from Joplin, Mo., is a superb product and so is yours. So even is Dilbert's, bunion brain and all. But,

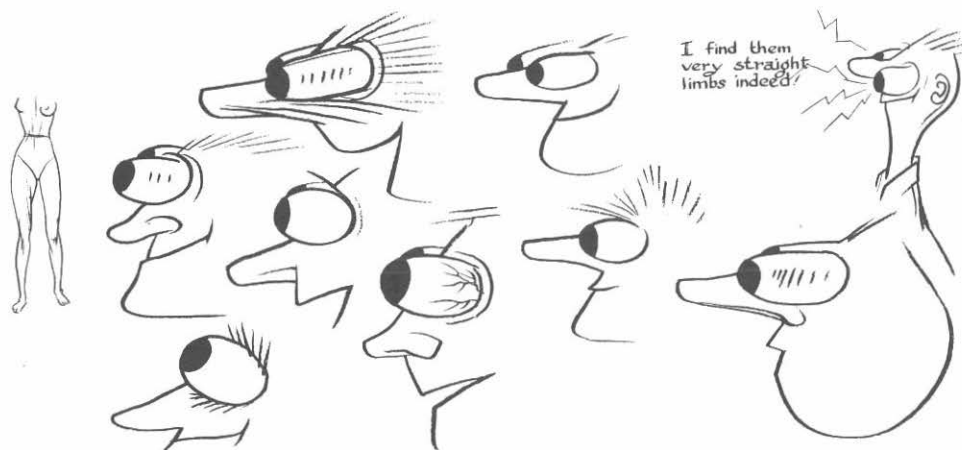


as you well know, that body was constructed for use on the ground, not for acrobatics in the air.

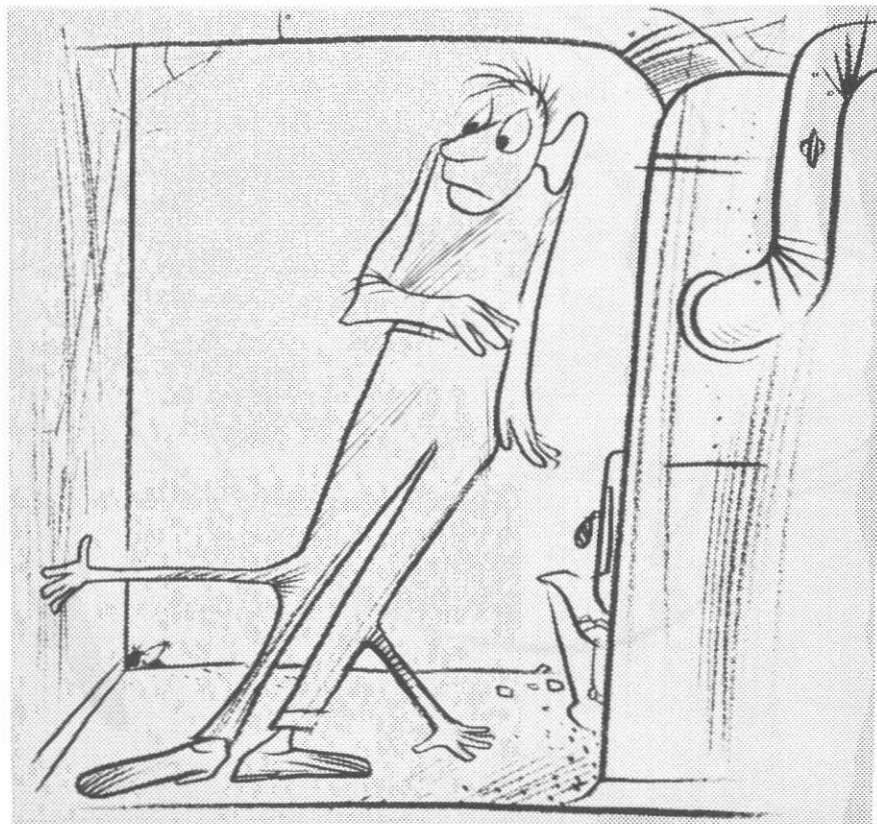
Old-fashioned people used to predict a brief career for the airplane on just that basis. Flying was all right for birds, but men weren't 'meant' to make like swallows. "Ain't seen no human with feathers yet," they'd say and let 'er go in the general direction of the gabboon.



They had a point. The gadgets of the body that inform a fellow which way is up, that he's registering "Tilt," or swiveling one way or the other, are nicely developed for life on the ground, not balloons. The most important of these, of course, is the eye. Whenever possible, the same fellow checks every physical sensation, including the hot foot, with a look.

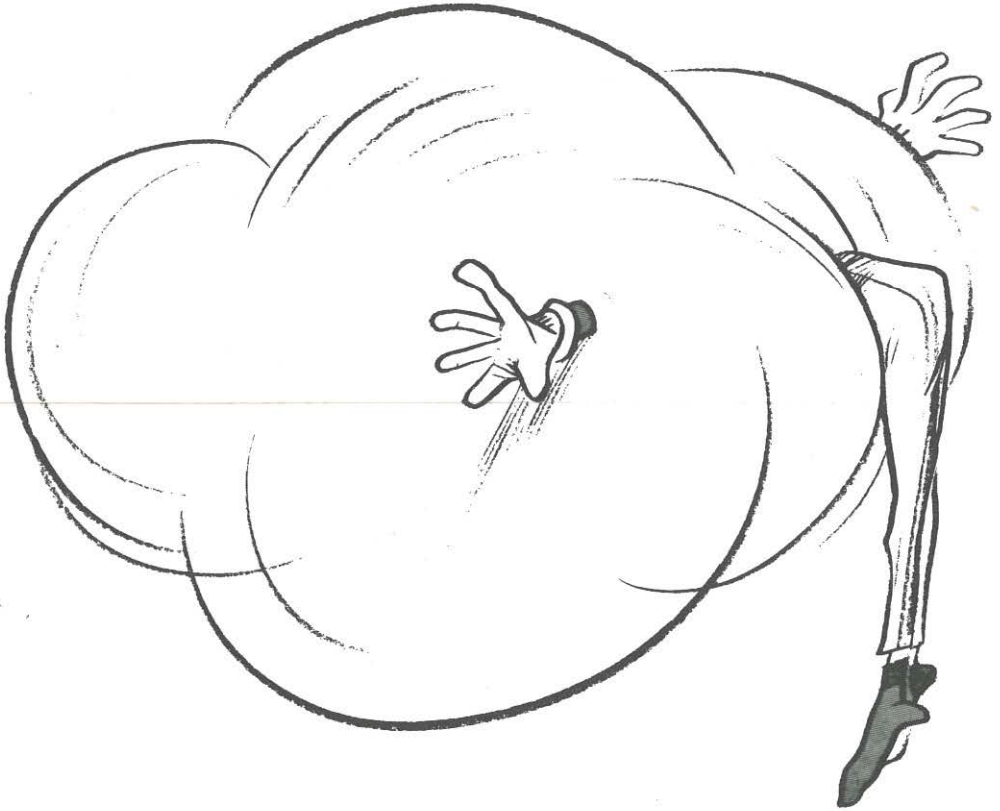


He knows he's leaning mostly because he gets a visual OK from a building he believes is straight, from a tree, or from the horizon. At night, caught in the coal bin with the fuses blown and visual checks hard to come by, our friend suddenly realizes how much he has been depending on that good eye for attitude and balance. "But," he whispers, "something is holding me up." He's right. Muscle sense and the mechanisms of the



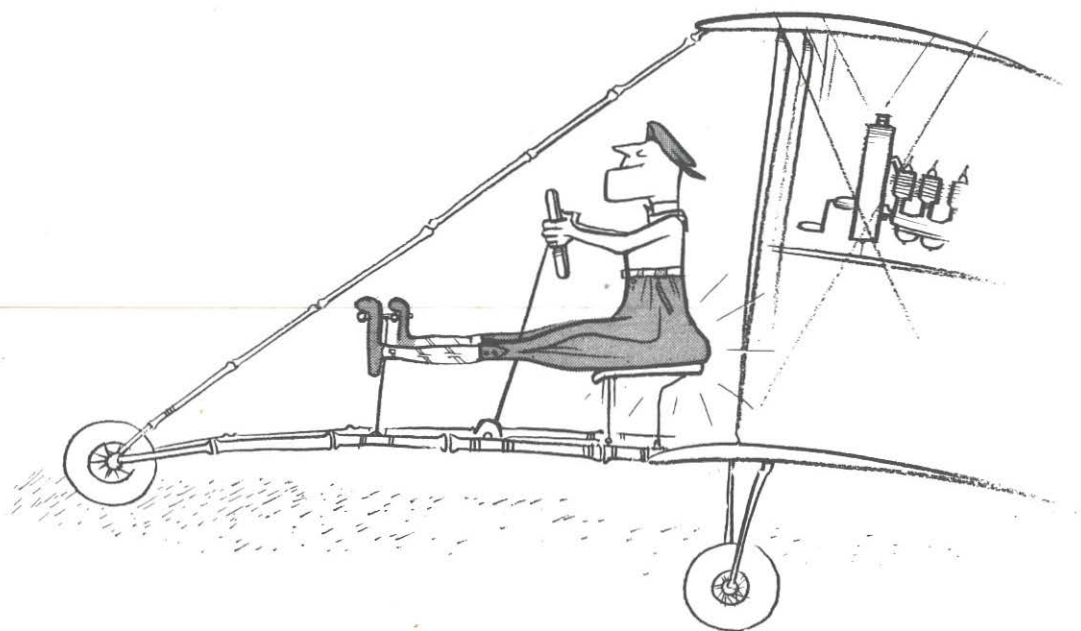
inner ear are giving him useful information. He can't check it with his eye, but he doesn't fall flat on his face. So these body gadgets help each other out, cover up for each other, *on the ground*.

The old folks, with their high opinion of birds, pointed out that things were different aloft. "Ain't the same as coal bins," they said. "A fellow can't see through the clouds *and* he ain't got his feet on the ground."



Which was true, as many an early aeronaut discovered. As long as he could fly in just about the same way he navigated on the ground—that is, by letting his eyes give him the visual OK—he got along pretty well.

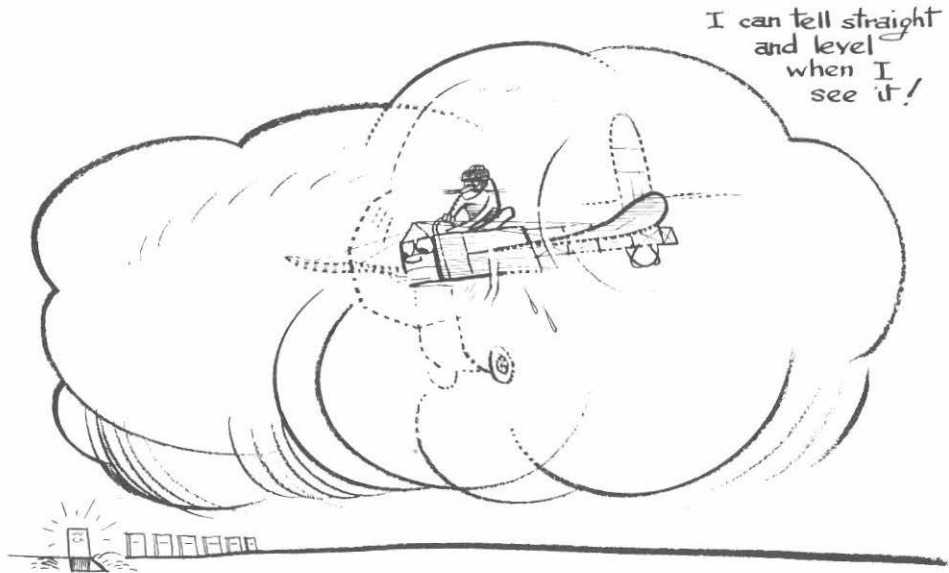
There was some loose talk about flying-by-the-seat-of-the-pants, but this was mostly to call attention to the pants themselves, in those days made out of snappy whipcord cut to flatter the hip. But once the visual OK was



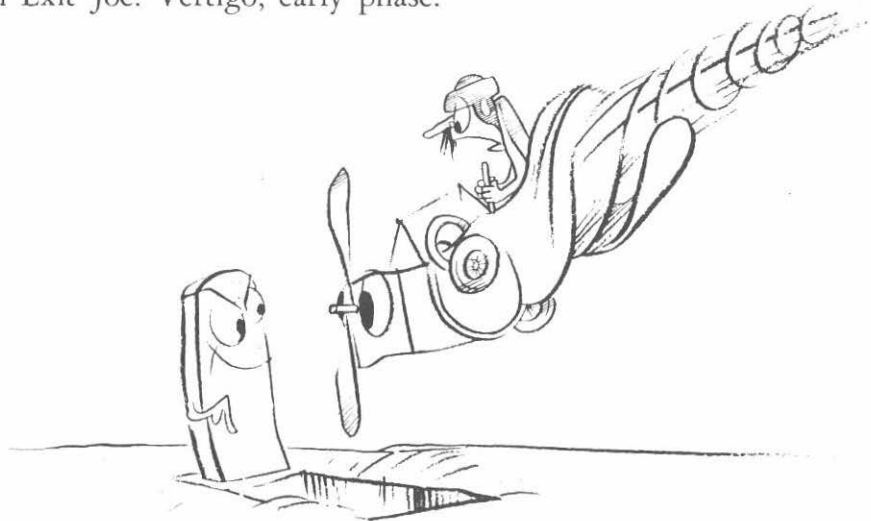
impossible, the other body gadgets did not want to cooperate the way they did for the fellow in the bin.

One Joe Bleriot pooh-poohed this. "They'll cooperate or else," he announced, pulling on his whipcord breeches. He entered the overcast, determined to prove he didn't need his eyes to fly. A sad thing happened.

Without being aware of it, Joe began a shallow turn, less than two degrees per second. The next second, still thinking he was straight and level, he added two more degrees to his turn. In ten seconds he was turning twenty



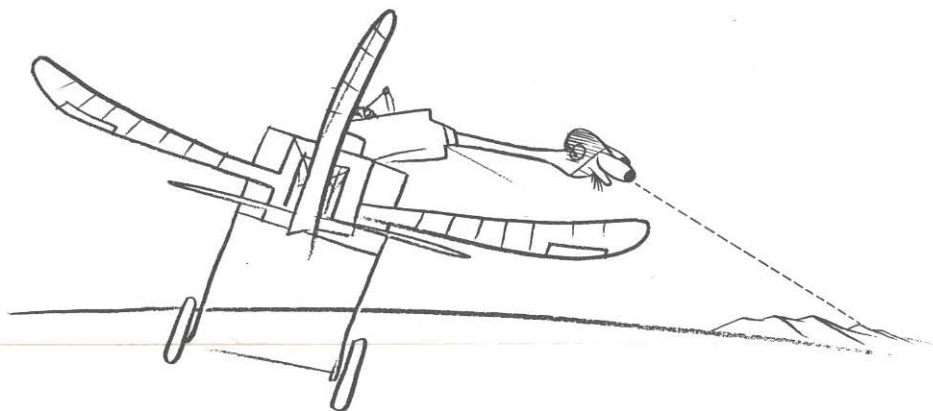
degrees per second and he still didn't know it. Enter the graveyard spiral and Exit Joe. Vertigo, early phase.



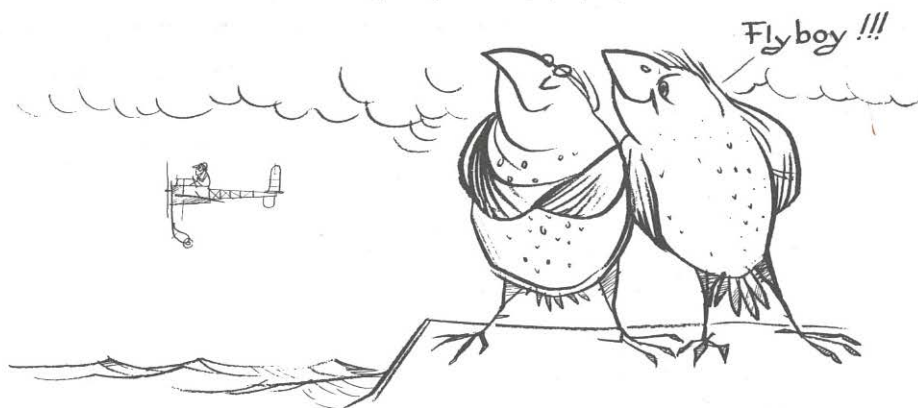
Put her there, Joe!

Without his eyes to guide him, Joe felt as if he were straight and level while he continued to wrap her up in a tightening turn. The feeling did not match the facts.

So reasonably safe flying in the early days was pretty much dependent on how well a pilot could see the horizon. Something about his other balance-attitude mechanisms went haywire when he couldn't get the



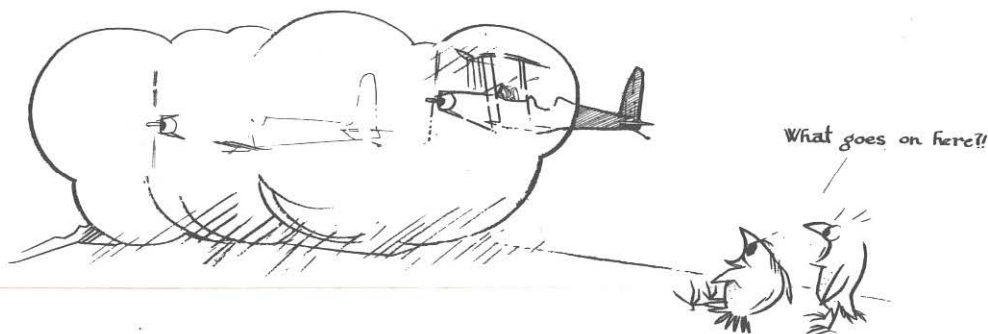
visual OK. The birds, no great shakes at night flying and terrible under instrument conditions, had no cause for envy as they watched the first aeronauts putt-putt by. "We can do anything they can do with one wing tied behind our backs," they told each other, "and do it better."



THE CASE OF THE PUZZLED PIGEON

Suddenly all this changed. Airplanes began flying through the overcast, in storms, and at night. Many of them even did it safely. Pilots made instrument approaches, most of them successful.

Huddled on their perches on foggy days, the birds muttered to each other about some people getting too big for their whipcord pants.



"I don't get it, mama," said a little pigeon named Plutarch. "You say I'm safe for solo, but you ground me every time it looks like rain. You won't let me fly at night. You make me keep away from clouds. But those Navy people across the Bay do everything you tell me not to, and they don't even have feathers."

"Go ask your father," said the mother pigeon. "He doesn't know much, but he might know that."

The father pigeon laid aside his book. "I've been wondering about the same thing, son," he said, "and I think I've got the answer." He pointed with his bill at the book, called *Blood on the Fud*. "Those people have developed a master race called 'Op's' or 'Private Eyes,' who see and know all. Listen." The father pigeon began to read.

I set fire to a cigarette with one hand and reached for the office bottle with the other, keeping my elbow on the Colt .45 mounted on the .38 frame.

The blonde crossed her legs, revealing a generous section of milky thigh. "You," she said, "rat."

I laughed harshly, hurting the hole in my head. The bourbon set fire to my stomach. "That," I said, "is a matter of opinion."

The blonde sneered. "What," she said, "a wit."

That was better. I knocked the Tommy gun out of her hands with the office bottle and swept her to me. I could smell the Chanel No. 11 and I coughed harshly.

"Woo," she said, "woo."

"No more funny stuff," I said. "You got to rely on the Private Eye."

"Yes," breathed the blonde. "Yes. From here on out I will always trust you. The Private Eye is always right."

*Holy Smokes and
Nakid Starlings!*

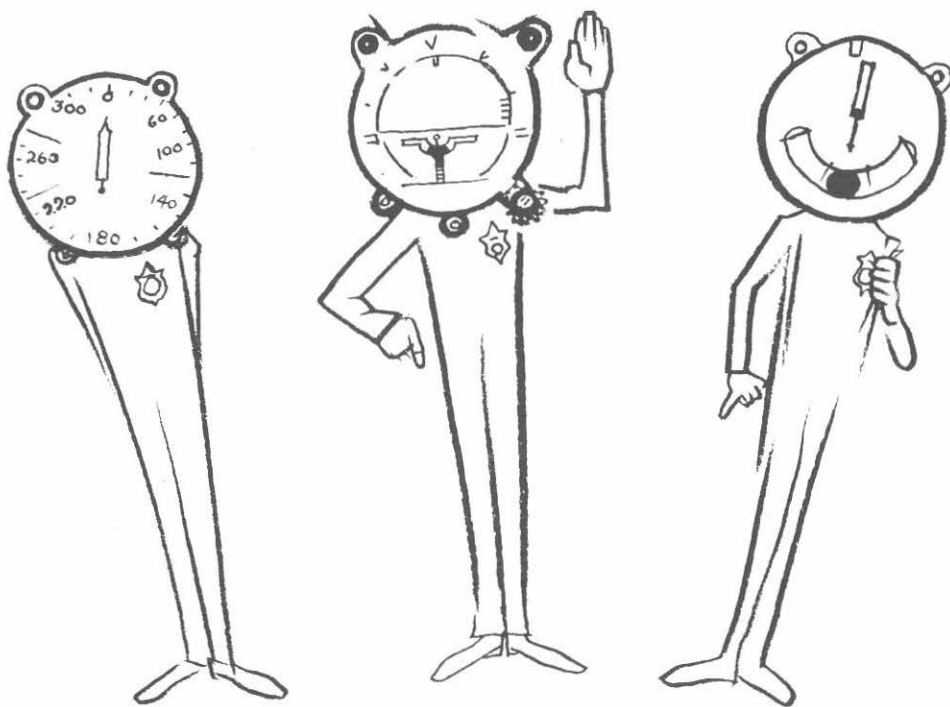


Little Plutarch shuddered. "My, my," he said.

"The way I figure it," said the father pigeon, "they have a Private Eye in every airplane. Hell, son, if he can see through a blonde, he ought to be able to see through clouds."

IT'S ELMER

You guessed it. The Private Eye is by Sperry, not Dashiell Hammett. Not until the gyro was perfected could pilots fly on an even keel through the overcast or other conditions of near-zero visibility. The gyro-horizon and the other instruments equal the pilot's Private Eye. In the pocket



SPERRY DETECTIVE SERVICE!

books, characters without faith are nabbed by the D.A. And pilots who don't trust him in airplanes may be tagged for keeps by vertigo.

That's because, with the pilot's own visual reference gone, his other body mechanisms are too easily confused in the air. The fellow who

Look here, Dil!



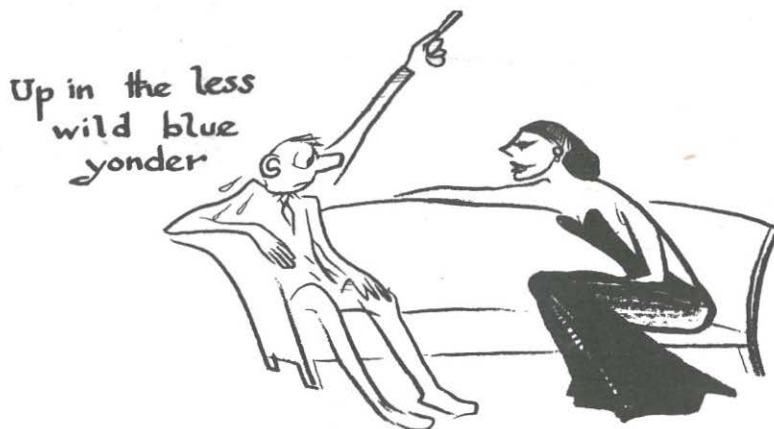
The seat is obsolete!

wound up his dive in a left bank when he thought he was tilted to the right was a victim of sense confusion. Not until he checked with the Private Eye did he know the real attitude of his plane. The gent under the hood was flying by feel, not his instruments, when he kept on turning after he thought he had leveled off. The Private Eye was right there with the correct dope, but the young man put his trust in the seat of his pants. If the birds can't get away with that kind of operating, there's no reason to think a j. g. can.

The instruments in modern airplanes are designed to make up for the deficiencies of the human body, which is dandy on the ground but easily confused upstairs. No pilot can get along without them because his own equipment is just not good enough. If it were, people would never get vertigo.

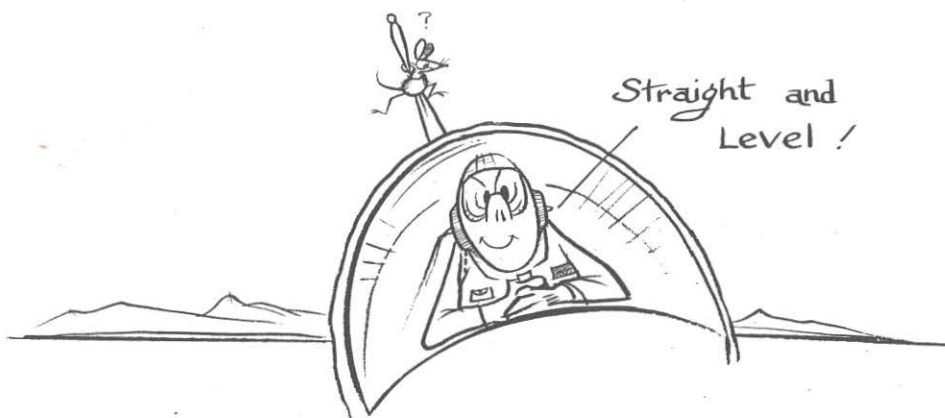
SPOTLIGHT ON DILBERT

"I don't feel at home on this divan," Dilbert tells the lady. "It's more natural for me to be up there in the blue, tooling along."



If he's a natural flyer, he's got a kind of internal balance-attitude mechanism that nobody else has; so he ought to be able to fly under the hood and report his attitude correctly. Dilbert should not get vertigo.

He's in the air now, under the hood without instruments, and on inter-com. The plane is straight and level and our boy tells us so: "Level as a pool table," he says.

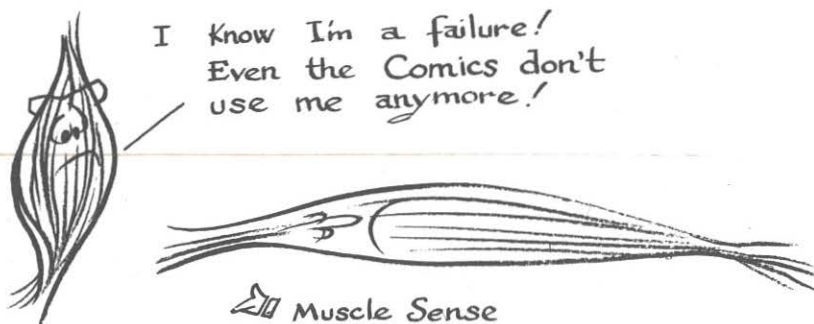


The pilot starts a smooth shallow turn and prolongs it. Of course the gyro-horizon indicates the fact.

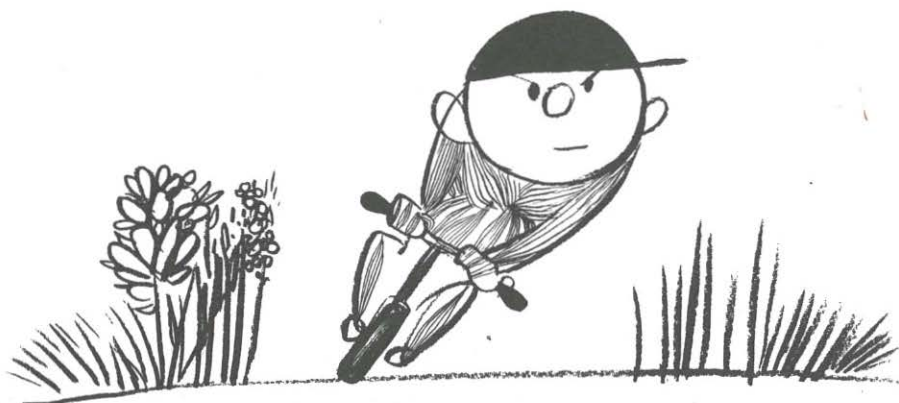
"Allee samee chop chop," reports Dilbert. "Still on that pool table and quit kidding."

He's as much of a natural flyer as a mouse. Since he couldn't see and could get no visual OK, Dilbert was trying to rely on the two other factors which control the seat of his pants: muscle sense and the balance-attitude mechanisms within the inner ear. They misled him, just as they will mislead any human being in the air.

The thing called muscle sense, which is merely the effect of gravity and inertia on the human muscles, doesn't rate much attention. In any



kind of rough air there are so many conflicting tugs on the muscles that nobody would put any trust in their messages. On a scooter, *yes*; in the air, *no*.

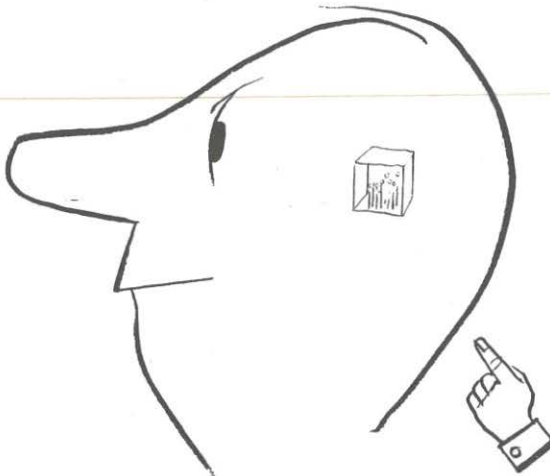


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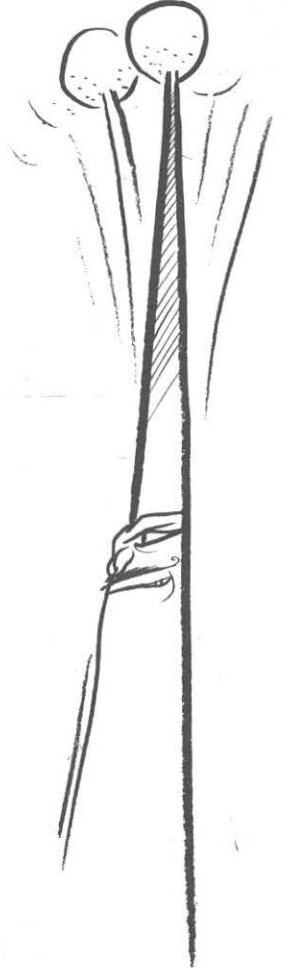
It's the hairy little faker inside Dilbert's head (and yours) that interests the doctors. They say two things about him:

1. He should never be allowed to control any pilot's actions in an aircraft.
2. He'll try.

This is the HAIR
A VILLAIN



POSING AS
AN UPRIGHT,
UPSTANDING GUY
THIS IS WHERE THE VILLAIN
DOES HIS DIRTY WORK



Under ordinary circumstances nobody pays him much mind. He sends his phoney messages to the brain, but as long as they can be double-checked

the brain gives them a cool reception. The faker gets The Treatment, like the man who wanted bread with one meatball.



In the medical books he's called the "otolith." Oto is full of little hairs, each with a tiny crystal on top as a kind of calcium crown. When Dilbert or anybody else is upright on the ground, the force of "G," due to gravity, holds each hair upright too; and Oto communicates this interesting fact to the brain, which probably pretends not to hear. That fellow in the dark coal bin had no visual OK to go by; so his brain allowed Oto to get in a word. The word was "Upright" and happened to be correct.

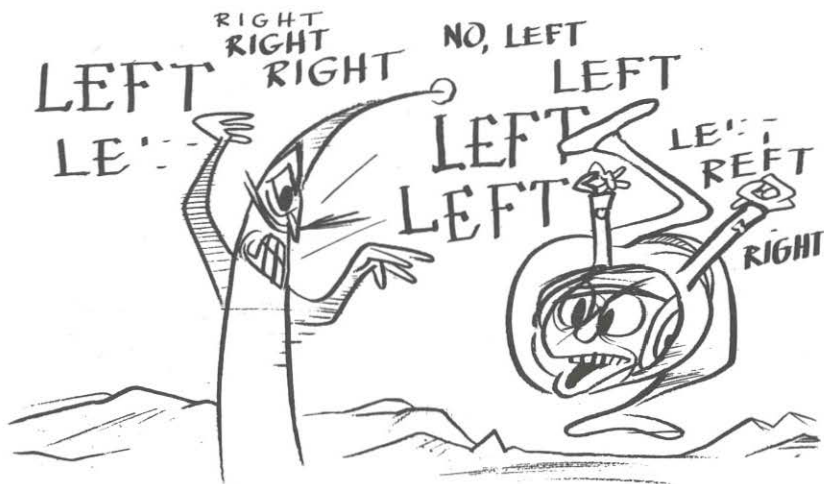
But Oto reveals a repulsive character in the air. He was the one who told Dilbert the plane was straight and level when the Private Eye said



"Tilt." In the absence of any way to double-check, Dilbert's brain took Oto at his word, but Oto was lying. Two factors, the centrifugal force of the turn and "G," combined to hold Oto's hairs upright with relation to Dilbert's head. Oto said nothing right about the real attitude of the aircraft.



The otolith is one fat reason why nobody is a natural in the air. Oto's actions help explain why flying people have those wrong ideas about aircraft attitudes which produce vertigo. *His specialty is aerial confusion.*



THE EERIE CANALS

Another set of jokers within the inner ear, the semi-circular canals, are full of aviation fakery. Highly respected gadgets on the ground, they can go looping aloft. Like the otolith, these canals are lined with little

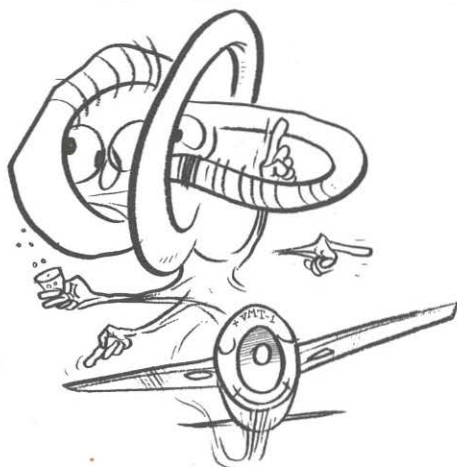


On the GROUND —OK!

In the AIR... TERRIBLE!

hairs responsive to changes in the direction of the liquid floating around them. Cued by movements of the head, the liquid diverts the hairs, which send turning messages to the brain. In the absence of other information, the brain is likely to believe them.

When the semi-circular canals are given the air treatment—up-and-down, turn-around, bank-level off, dive-recover—their liquid can be agitated like a gin fizz. In that state the hairs will tell the brain anything, even the old one about the two seagulls and the Yale-Harvard boat race.



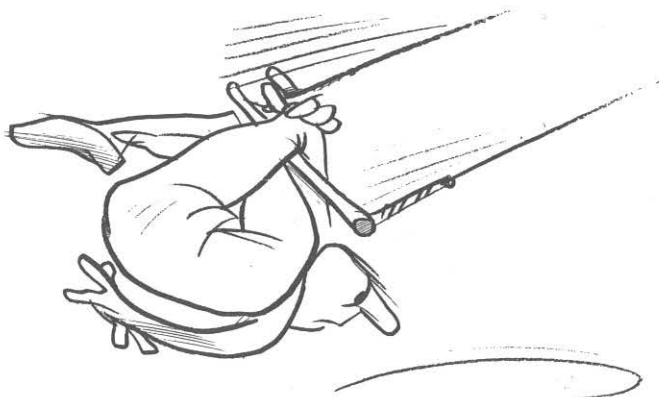
So the pilot ending a maneuver, more or less abruptly, rolling out of a turn, will have the feeling of still being in the turn, mostly because his semi-circular canals are transmitting conflicting information to his brain.

He has



The pilot doesn't have to be in instrument weather to be confused. Even when he has a fine natural horizon to check with, the semi-circular canals can make him feel so dizzy after a violent maneuver that he must exert a real effort of his will to get his bearings. Subjected to such sensations at night or in near-instrument weather, a fellow can get himself into a state that won't be Rhode Island.

So the physical causes of vertigo help to explain aerial confusion. Let's face it: the human body is a weak sister in the air. Alone and unassisted, it's just not good enough for modern flying.

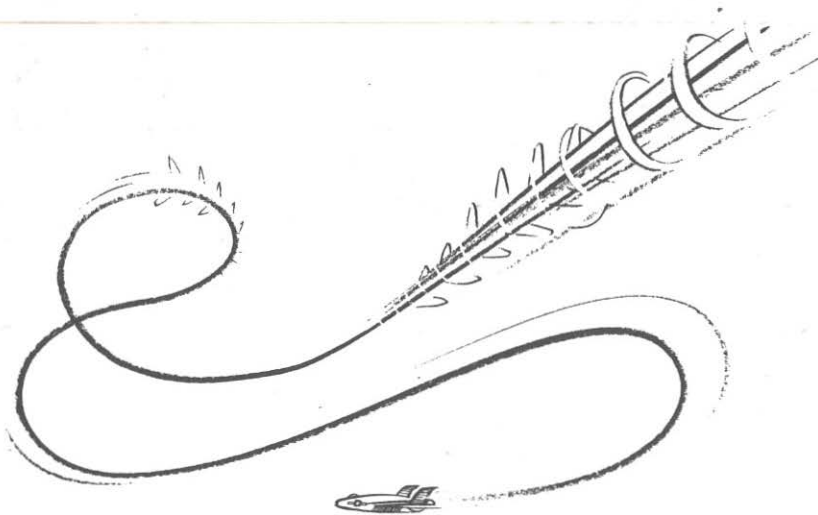


BUT —

The human MIND is. That's one reason why the five-thousand-hour pilot is less subject to aerial confusion than the fellow just reporting to Instrument Squadron. His intelligence, interpreting his experience, keeps telling him the oldest aviation truth: being in the air is a whale of a lot different from being on the ground. He knows he must make allowances for that weak body when it is hashed around by the "unnatural" act of flying.

In the psychologist's lingo, he has adapted himself to a new environment.

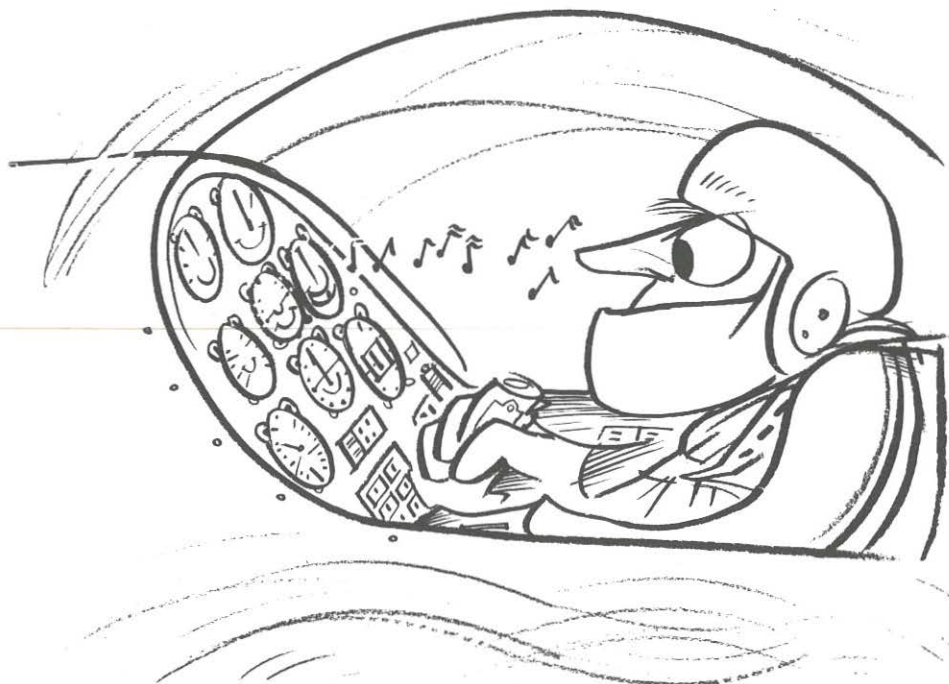
The smart gent is on the look-out for phoney body sensations. He knows violent maneuvers can scramble the works of the inner ear and that Oto and the canals will start telling him stories. Five thousand hours



Now watch Oto fib!

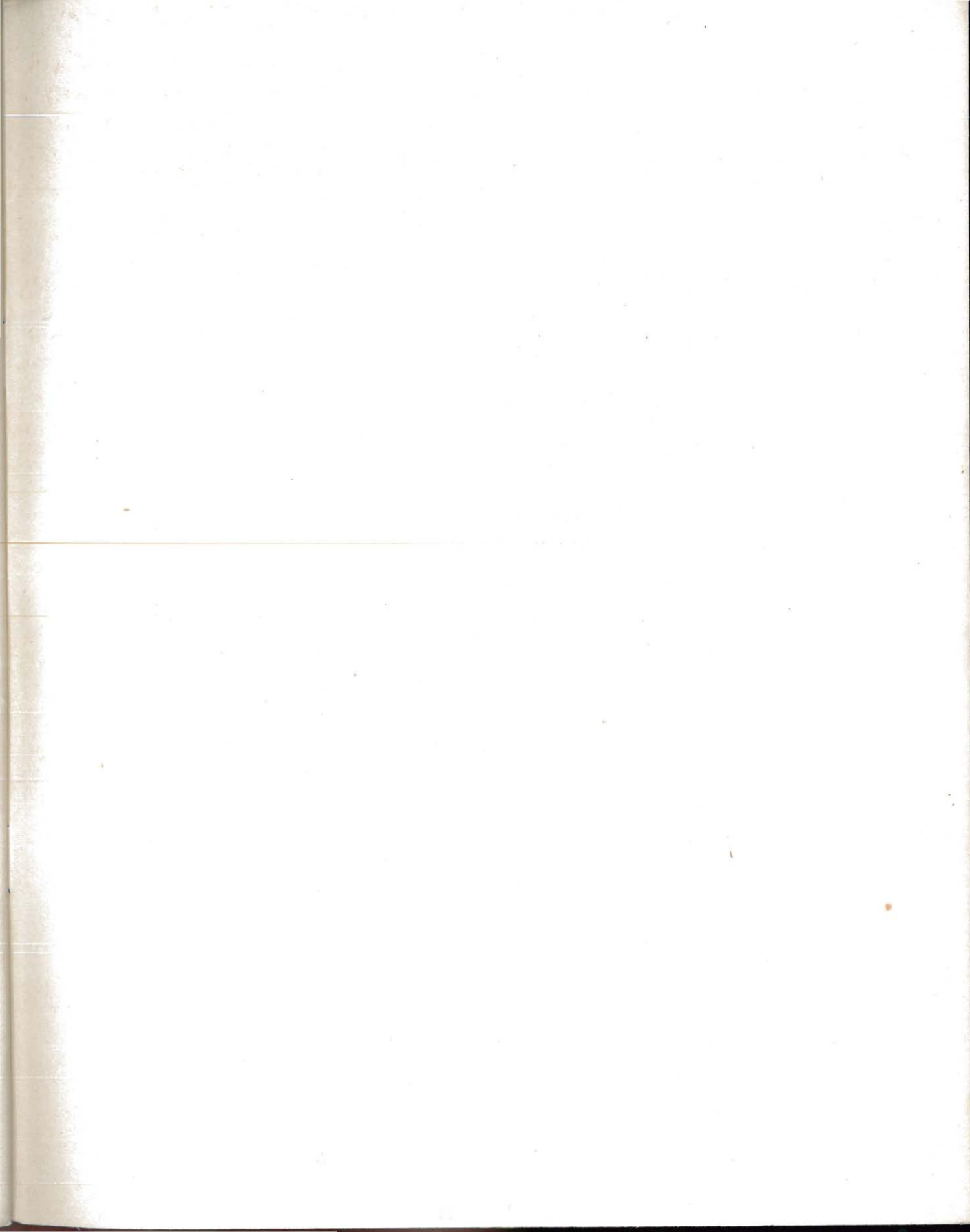
have convinced him that even his eyes will do him dirt, especially at night, when the stars can swing around or lights seem to "split." Rolling out of a turn, he may still *seem* to be in it, but he checks with his instruments immediately for the right word. Mind over matter, every time.

But the smartest act of his mind is putting complete trust in the Private Eye, regardless of what aerial sensations the body shoots up to the brain. "I always rely on the Private Eye," says the savvy pilot and that faith pays off. Vertigo can visit the sharpest pilot in the Fleet but its effects can be minimized by reliance on the instruments, no matter how loud Oto and his friends howl for recognition.



INSTRUMENTAL MUSIC!

Every tot needs his mama and every pilot needs his instruments. If he's to meet and beat vertigo, he must believe what the instruments say. He's got to believe in them the way he used to believe in Santa Claus. And they will never let him down by turning out to be only papa, with whiskers.



YOU WILL RELY
ON US
FOR COMMANDS.

AYE! AYE! SIR!

